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Indian Standard

METHOD OF TEST FOR
WOOL FIBRE LENGTH (BARBE AND
HAUTEUR) USING A COMB SORTER

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METHOD OF TEST FOR WOOL FIBRE LENGTH (BARBE AND HAUTEUR) USING A COMB SORTER

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Indian Standard

METHOD OF TEST FOR WOOL FIBRE LENGTH (BARBE AND HAUTEUR) USING A COMB SORTER

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 18 March 1977, after the draft finalized by the Physical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 This standard is mainly based on ISO/R 920-1969 ' Method of test for wool fibre length (barbe and hauteur)' using a comb sorter, published by the International Organization for Standardization.

0.3 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes a method for the determination of wool fibre length, barbe and hauteur, and their coefficients of variation, by means of a comb sorter. This method is applicable to twistless combed wool slivers and to prepared wool slivers (rovings).

2. PRINCIPLE

2.1 A numerical sample of the fibres is taken and the fibres are classified by lengths. They are then divided into length groups and weighed.

3. TERMINOLOGY

3.0 For the purpose of this standard, the following definitions shall apply.

3.1 Barbe — The mean length of the fibres of a sliver or of a roving, calculated from the proportions by mass of the fibres in the sliver or the roving.

If

$n_1, n_2 \dots$ represent the number of fibres in each length group,

$L_1, L_2 \dots$ represent the length of each group of fibres, expressed in millimetres,

*Rules for rounding off numerical values (*revised*).

$a_1, a_2 \dots$ represent the linear density of fibres of each group,

$P_1, P_2 \dots$ represent the total mass of the fibres belonging to each length group,

then the barbe is equal to

$$\frac{n_1 a_1 L_1^2 + n_2 a_2 L_2^2 + \dots}{n_1 a_1 L_1 + n_2 a_2 L_2 + \dots} = \frac{P_1 L_1 + P_2 L_2 + \dots}{P_1 + P_2 + \dots}$$

3.2 Hauteur — The mean length of the fibres of a sliver or of a roving, calculated from the proportions by titre of the fibres in the sliver or the roving.

If the same symbols are used as for the barbe, the hauteur is equal to

$$\frac{n_1 a_1 L_1 + n_2 a_2 L_2 + \dots}{n_1 a_1 + n_2 a_2 + \dots} = \frac{P_1 + P_2 + \dots}{\frac{P_1}{L_1} + \frac{P_2}{L_2}}$$

4. ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

4.1 The test sample shall be conditioned to moisture equilibrium from dry side in the standard atmosphere of 65 ± 2 percent relative humidity and $27 \pm 2^\circ\text{C}$ temperature (see IS : 6359-1971*).

4.2 The test shall be carried out in standard atmosphere.

5. APPARATUS

5.1 Comb Sorter — Consisting basically of a bed of combs which can be lowered successively and of which the spacings determine the classes of the fibre lengths. The apparatus shall permit the following operations:

- Successive draws of several tufts of fibres at the squared-off end of a sliver or a roving.
- The deposition of these tufts as they are drawn on to the comb bed so that the aligned ends of the combed fibres in each tuft are placed on the last comb.
- The removal of the fibres which project beyond each comb by means of a drawing off system, starting with the longest fibres.

NOTE — A type of apparatus which performs these operations semi-automatically is described in Appendix A.

5.2 Balance — Capable of measuring to an accuracy of 1 mg.

*Method for conditioning of textiles.

6. PREPARATION OF TEST SPECIMENS

6.1 From each sliver or roving to be tested, a test piece of 1 metre in length should be taken. It should be twisted (approximately 20 twists), and its two ends placed side by side and held in the hand, so that the folded sliver or roving then twists slightly upon itself. This slight twisting is intended to prevent the test piece from losing fibres or from becoming distorted during its exposure to the standard atmosphere.

7. PROCEDURE

7.1 Positioning of Fibres on the Combs — Place the untwisted test piece at the position specified on the apparatus for drawing off the tufts; the end from which the fibres are to be taken should project by about 200 mm. Using the hands and then by means of a grip, square off the end by taking and discarding small quantities of fibre, not exceeding 12.5 mm increments, from the overhanging end of the test piece until just enough tufts of fibres project for the following operations:

- a) Using the grip, draw off further tufts of wool from the squared-off end of the sliver or roving to give a test specimen of mass 500 to 4 000 mg, and arrange it on the bed of combs. Bring the aligned ends of the combed fibres to the last comb.
- b) Regulate the depth of the wool in the combs by pressing with a rod or other suitable device.

7.2 Sorting of Fibres by Length Groups — Lower the combs one by one, until the ends of the longest fibres project beyond a single comb. Note the number of combs remaining in the raised position so as to calculate from this the average length of the longest length group. Using the drawing device, draw off the projecting fibres. Then place them on one side for weighing. Lower the next comb, again draw off the projecting fibres and place them in a separate group for weighing.

7.2.1 Continue in this way until the last group of fibres is reached. Weigh the fibres in each group to an accuracy of 1 mg.

8. CALCULATION AND EXPRESSION OF RESULTS

8.1 Presentation of Results — The necessary information should be given in a table, an example of which is given below*:

*The figures given as examples in the table refer specifically to the Schlumberger apparatus.

Groups mm	L mm	L ²	Po (Masses) mg	R (Percentages of Masses of col 4)	RL	$\frac{R}{L}$	RL ²
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
195/205	201	40 401					
185/195	191	36 481					
175/185	181	32 761					
165/175	171	29 241					
155/165	161	25 921					
145/155	151	22 801					
135/145	141	19 881					
125/135	131	17 161					
115/125	121	14 641					
105/115	111	12 321					
95/105	101	10 201					
85/95	91	8 281					
75/85	81	6 561					
65/75	71	5 041					
55/65	61	3 721					
45/55	51	2 601					
35/45	41	1 681					
25/35	31	661					
0/25	18	324					

100·000

A B C

NOTE — The totals of col 6, 7 and 8 are designated by the letters A, B and C. Other columns may be added in order to indicate the cumulative masses and frequencies (percentage).

8.2 Calculation — As a function of A, B and C calculate the hauteur and barbe of the fibres and the corresponding coefficients of variation, by application of the following formulae:

a) *Hauteur*, mm =

$$\frac{100}{\sum \frac{R}{L}} = \frac{100}{B}$$

b) *Barbe*, mm =

$$\sum \frac{RL}{100} = \frac{A}{100}$$

$$c) \text{ Coefficient of variation of hauteur (as a percentage) } = \frac{\sqrt{(A \times B) - 10\,000}}{A^2}$$

$$d) \text{ Coefficient of variation of barbe (as a percentage) } = \frac{100\sqrt{C \times 100}}{A^2} - 1$$

9. REPORT

9.1 The report shall include the following information:

- a) Type of material tested,
- b) Type of apparatus used, and
- c) Fibre length:
 - 1) Hauteur, mm;
 - 2) Barbe, mm;
 - 3) Coefficient of variation of hauteur, percent; and
 - 4) Coefficient of variation of barbe, percent.

10. ERROR OF THE METHOD (REPRODUCIBILITY OF METHOD)

10.1 Tests on six slivers of wool fibres, repeated three times, by six different laboratories gave the results as given below:

	<i>Error of Method (see Note)</i>	<i>Maximum Interval of Measurement, Percent</i>
Hauteur	0.86 mm	4.3
Barbe	0.70 mm	3.2
Coefficient of variation of hauteur	0.96 percent	7.3
Coefficient of variation of barbe	0.63 percent	5.2

NOTE — The error of the method is defined as follows:

- each lot measured obtains, in each laboratory, a mean value;
- the means of the six laboratories make it possible to calculate an inter-laboratory mean which is distributed with a certain inter-laboratory standard deviation for each lot; and
- the error of the method is the quadratic mean of these inter-laboratory standard deviations for all the lots.

APPENDIX A

(Note under clause 5.1)

SCHLUMBERGER COMB SORTER, TYPE M.A.E. FOR THE DETERMINATION OF WOOL FIBRE LENGTH*

A-1. CHARACTERISTICS

A-1.1 The Schlumberger type M.A.E. comb sorter comprises a feed trough for the sliver which is driven to and fro, thus feeding the squared end of the sliver to a grip which lies above a bed of combs whose spacings determine the length groups of the fibres. This bed of combs may be moved laterally (in a direction perpendicular to that of the fibres in the feed trough), while the combs themselves can be lowered successively in a similar manner to a gill box used in spinning. A drawing-off system consisting of two endless leather belts is located at the front edge of the bed of combs and a circular brush collects the fibres drawn off.

A-1.2 The sequence of operations carried out semi-automatically is as follows:

- a) Movement of the feed trough towards the grip, thus taking successive draws of fibres of which the gripped ends are aligned.
- b) Deposition of tufts drawn, over the whole width of the bed of combs which moves laterally each time the feed trough moves. The aligned ends of the fibres are placed on the last comb.
- c) Removal of the fibres projecting beyond each comb by means of a drawing-off system during the lateral movement of the bed of combs, starting with the longest fibres.

A-2. PROCEDURE

A-2.1 Arrangement of Wool on Combs

A-2.1.1 Place the sliver in the feed trough of the comb sorter, projecting 200 mm towards the grip. The part of the sliver in the feed trough is under very slight tension.

A-2.1.2 Square off the sliver, first of all by hand up to approximately 10 mm from the comb being fed and then by twenty draws by means of the grip, forming a length of $20 \times 4 \text{ mm} = 80 \text{ mm}$ of sliver (with the comb sorter operating and the comb bed removed).

*The information given on this apparatus is not intended to favour its use or to give a preference to the use of this apparatus.

A-2.1.3 Verify that all the combs are at the same level, except for the last which should remain below the others and which will be raised later.

A-2.1.4 The combs are then covered with the wool automatically over the whole length of movement of the carriage. When this operation is completed, the last comb is raised to the level of the others.

A-2.1.5 Regulate the depth of wool in each spacing by pressing it down slightly with the rod designed for this purpose (a rod curved at both ends) and starting with the last spacing, that is, that of the shorter fibres. Carry out the operation a second time.

A-2.1.6 Place the retaining rod (not curved at the ends) in the next to last space.

A-2.2 Length Sorting by Means of the Comb Sorter

A-2.2.1 The comb bed comprises a series of a consecutive spacing of 10 mm.

A-2.2.2 Depress the first combs until the longest fibres have their ends projecting beyond a single comb. It is essential here to evaluate correctly the first mean of the group under consideration. For this purpose, the number of remaining combs is taken as n , and the mean length of the group is taken as $10(n + 1)$, expressed in millimetres. This value is justified empirically. Thus the number of groups in existence can be seen.

A-2.2.3 The fibres are collected on the brush in the usual way by moving the carriage completely in both directions for each space of 10 mm. These samplings per group are weighed separately on a balance giving an accuracy of 1 mg.

A-2.2.4 The last group to be taken should be specified. The next to last sampling is done mechanically with the two drawing off belts; it covers the groups of fibres projecting beyond the last three combs (group with a mean length of 31 mm). The antepenultimate comb is then lowered. The last sampling is done by hand on the fibres remaining at that point on the last two combs. This group has a mean length of 18 mm.

INDIAN STANDARDS
ON
PHYSICAL METHODS OF TEST

IS:

- 234-1973 Linear density of textile fibres (gravimetric method) (*first revision*)
832-1964 Twist in yarn
1348-1971 Kemp content of raw wool (*first revision*)
1377-1971 Mean fibre length of wool (*first revision*)
1670-1970 Breaking load, elongation at break and tenacity of yarn (*first revision*)
1954-1969 Length and width of fabrics (*first revision*)
1963-1969 Threads per decimetre in woven fabrics (*first revision*)
1964-1970 Weight per square metre and weight per linear metre of fabrics (*first revision*)
1966-1975 Bursting strength and bursting distension of fabrics diaphragm method (*first revision*)
1969-1968 Breaking load and elongation at break of woven textile fabrics (*first revision*)
2702-1965 Thermal resistance of textile fabrics, guarded hot-plate method
2899-1965 Percentage of medullated fibres in wool
3689-1966 Conversion factors and conversion tables for yarn count
4681-1968 Wrinkle recovery of fabrics (by measuring crease recovery angle)
4902-1968 Correct invoice weight and moisture content of woollen and worsted yarns
6124-1971 Crimp in wool
6359-1971 Conditioning of textiles
6489-1971 Tear strength of woven textile fabrics by Elmendorf tester
6490-1971 Stiffness of fabrics — cantilever test
6637-1972 Moisture in wool
6653-1972 Staple length of greasy wool
6668-1972 Preparing test specimens from fabric samples for physical tests
6919-1973 Wool fibre diameter by airflow method
7702-1975 Thickness of woven and knitted fabrics